

We are familiar with this species as a migrant in Great Britain, and feel that this bird was a ♂ in view of the distinct black head-markings (more diffuse and browner in a ♀), and general 'smartness' of the underparts.

Walters (1980) reports that this species breeds in the north-taiga zone of Eurasia.

CALF OF MAN BIRD OBSERVATORY,  
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wintering south to Japan and East China; King *et al.* (1978), give it migrant status in Taiwan. To the best of our knowledge there is no previous record of Rustic Bunting from Nepal or India, (T. P. Inskipp informs us that another individual was reported from Nepal later in the spring of 1981).

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### 11. OBSERVATIONS ON FOOD REQUIREMENT AND FOOD CONVERSION IN THE MUGGER (*CROCODYLUS PALUSTRIS*) REARED IN CAPTIVITY

(With two text-figures)

The present paper is based on observations made on 15 mugger crocodiles (*Crocodylus palustris*) which were reared between 1975 and 1980 at the Gharial Research and Conservation Unit (GRACU), Tikerpada, Orissa, a place within the distributional range of the species. Hatchlings were reared in pens of 4 x 4 m area with a central pool of 2 x 2 x 0.3 m in size. Older mugger were kept in yearling pens of 6 x 6 m size with a pool of 4 x 4 x 1 m. All mugger were reared under ideal husbandry conditions described by Bustard *et al.* (in press).

The initial number of 15 mugger was reduced to 13 at 6 months, 10 at 45 months and

6 at 53 months due to transfers from GRACU to other rearing/breeding centres. Out of a total of 4,855 Kg of food given to these mugger only about 60 Kg (1.2%) consisted of 'undressed' mammalian (wild boar, sambar, cheetal, rat and civet) and reptilian (fresh-water terrapins, snake and crocodilian), meat and birds (crow, country fowl, pigeon and owl), the rest consisted of a mixed variety of fish species and prawn collected from the adjacent Mahanadi river. The low composition of non-fish items in the diet was a result of non-availability of these. The 'sport meat' fed were purchased by the project during auction of 'seized meat' by the department.

MISCELLANEOUS NOTES

Food quantities have been calculated from actual amounts the mugger had eaten till satiation. The frequencies of feeding were every other day during summer and autumn, and 2-3 days per week during the winter and rains. Hatchlings up to 9 months old were provided with live fish in their rearing pools. Hence, they fed every day as per their requirement. Non-living food were provided in the enclosures mostly between 9 and 11 a.m. and occasionally in the evening. Day-time feedings followed removal of uneaten food after an hour. Left-overs from evenings were removed

on the following morning.

The food requirement of hatchlings was proportionately high, over 3-5% of the body weight. The requirement gradually lowered down to below 1% when the mugger were 5 years old and about 45 Kg in weight (Figs. 1 and 2). Table 1 shows that food intake was the lowest during winter and maximum during summer, through rain and autumn.

The food conversion (Table 2) was 12.4% during the first year, 22.9% during the second and 16.8% during the third. The mean conversion at the end of the third year 18.2%

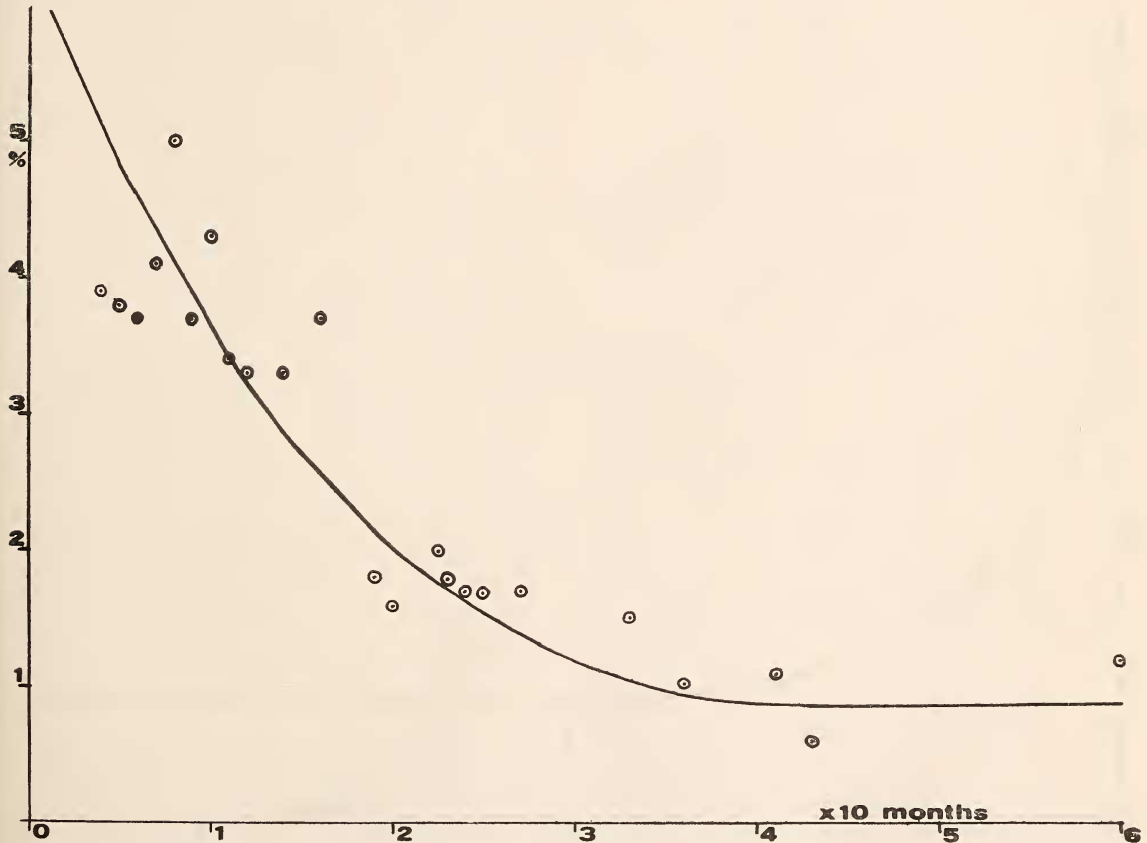


Fig. 1. Relationship between the percentage of body weight eaten by mugger at different months of age. Fluctuations off the curve are a result of seasonal impact.

and at the end of the fifth year 12.4%. There was evidently a decrease in conversion in the later years.

B. C. Choudhury (pers. comm.) comments that his mugger at Nehru Zoological Park, Hyderabad, fed with almost entirely meat diet show a lower food consumption rate but almost similar growth rates, therefore, a higher conversion rate.

Only fragmentary information are available on the growth of mugger in the wild (Acharjyo and Mohapatra 1978; Choudhury and Bustard 1982), but there are none on their

food conversion in the wild. However, there are a few publications providing evidence of a mixed-diet habit for the mugger. Stomach examination of shot-down mugger have shown the presence of, other than fish, aquatic beetles and bugs (D'Abreu 1915; McCann 1935, 1940), mollusc and *Rana tigrina* (D'Abreu 1915), pig (Pitman 1913 a), goat (Simcox 1905), and humans (Shortt 1921, Krishnamurthy 1951). Pitman (1913 b) had seen a dead panther on a river bank whose nature of injury suggested that it was attacked by a crocodile. Evidence or information about

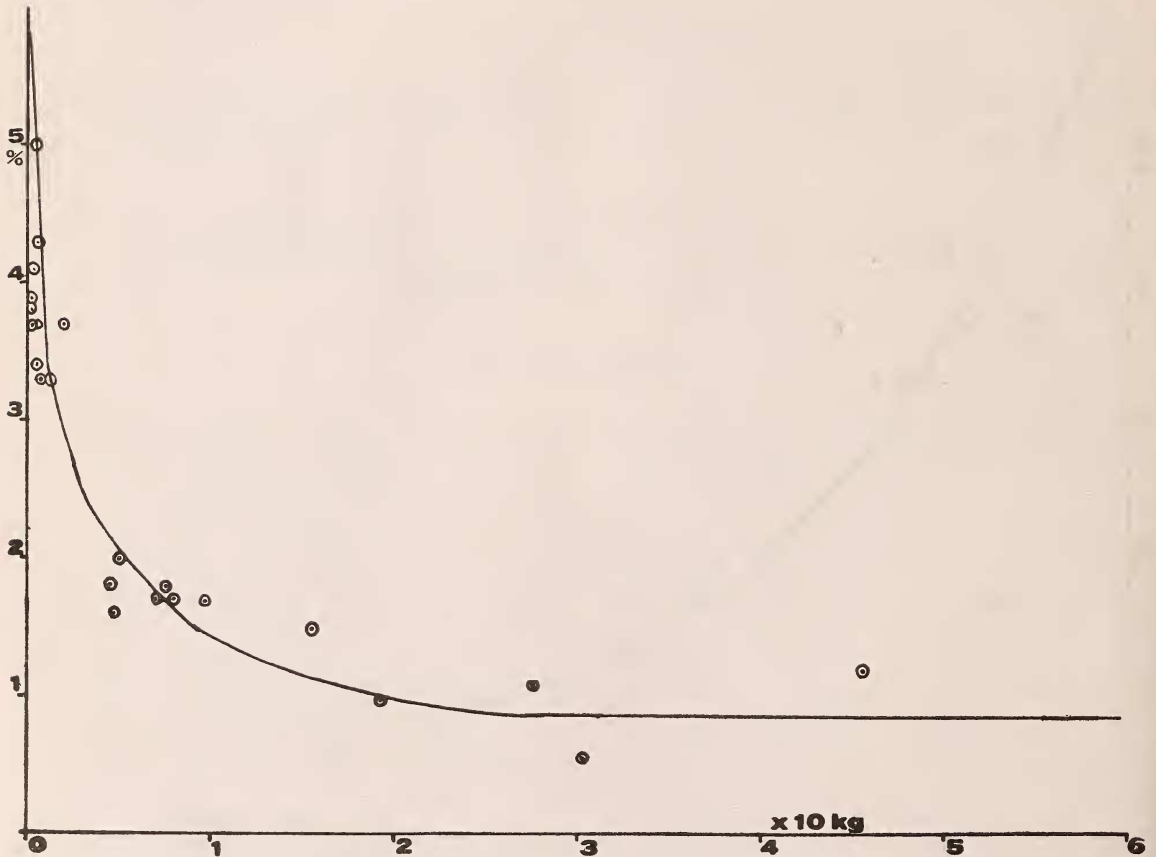


Fig. 2. Relationship between the percentage of body weight eaten by mugger at different body weight. Fluctuations off the curve are a result of seasonal impact.

MISCELLANEOUS NOTES

TABLE 1

PER DAY FOOD REQUIREMENT OF THE MUGGER  
(*Crocodylus palustris*) IN CAPTIVITY DURING THE  
FIRST FIVE YEARS

Month	Age in months	TBL (m)	W (gm)	F (gm)	F x 100 W
June	1	—	—	8	—
July	2	—	—	8	—
Aug	3	—	—	10	—
Sep	4	438	307	12	3.9
Oct	5	445	320	12	3.8
Nov	6	458	344	12.8	3.7
Dec	7	460	372	15.3	4.1
Jan	8	465	406	20.5	5.0
Feb	9	470	440	16.6	3.7
Mar	10	500	500	21.7	4.3
Apr	11	511	596	20.5	3.4
May	12	543	760	25.6	3.3
June	13	—	—	28.2	—
July	14	674	1305	43.5	3.3
Aug	15	—	—	29.4	—
Sep	16	749	2135	79.4	3.7
Oct	17	774	—	79.4	—
Nov	18	—	—	79.4	—
Dec	19	835	4505	83.8	1.8
Jan	20	849	4865	80.2	1.6
Feb	21	—	—	78.0	—
Mar	22	877	4985	102	2.0
Apr	23	888	5569	102	1.8
May	24	941	7000	120	1.7
June	25	981	7941	134	1.7
July	26	—	—	137	—
Aug	27	1084	9679	165	1.7
Sep	28	—	—	191	—
Oct	29	—	—	211	—
Nov	30	—	—	207	—
Dec	31	—	—	151	—
Jan	32	—	—	182	—
Feb	33	1290	15465	228	1.5
Mar	34	—	—	237	—
Apr	35	—	—	203	—
May	36	—	—	206	—
June	37	1483	19344	186	0.96
July	38	—	—	286	—
Aug	39	—	—	232	—
Sep	40	—	—	279	—
Oct	41	1654	27549	309	1.1

Nov	42	—	—	200	—
Dec	43	1696	30276	173	0.57
Jan	44	—	—	143	—
Feb	45	—	—	292	—
Mar	46	—	—	336	—
Apr	47	—	—	382	—
May	48	—	—	428	—
June	49	—	—	307	—
July	50	—	—	334	—
Aug	51	—	—	414	—
Sep	52	—	—	510	—
Oct	53	—	—	544	—
Nov	54	—	—	565	—
Dec	55	—	—	434	—
Jan	56	—	—	473	—
Feb	57	—	—	480	—
Mar	58	—	—	522	—
Apr	59	—	—	477	—
May	60	1968	45470	544	1.2

TABLE 2

YEARLY FOOD CONVERSION IN THE MUGGER

Age in months	Growth in length (TBLG cm)	Growth in weight (WG Kg)	Total food (TF Kg)	TBLG x 100 TF	WG x 100 TF
Hatching to					
1 year	26.3	0.685	5.49	479.0	12.4
1-2 year	39.8	6.240	27.15	146.5	22.9
2-3 year	54.2	12.344	73.14	74.1	16.8
Total for					
3 years	120.3	19.269	105.78	113.7	18.2
3-5 years					
3-5 years	48.5	26.126	259.92	18.6	10.0
Total for					
5 years	168.8	45.395	365.7	46.1	12.4

The length and weight at hatching have been considered as 28 cm and 75 gm respectively.

vegetable matter in the stomach are given by D'Abreu 1915 (14 paddy grains), Simcox 1905 (lilly stalks), and Abdulali 1938 (fallen fruits of *Ficus glomerata*). Faecal matters were examined in the field by Whitaker (1978) in the Gir and Vijaya (1981) at Sathanur. Whitaker saw remains of cattle egret feathers, fish scale and water snake, and Vijaya saw "feathers". In the Satkoshia Gorge I had seen the pug marks of a mugger, about 3 m long walking up and down the river bank to a distance of about 50 m away from water where remains of a giant squirrel were lying. With B. C. Choudhury and trainees of Central Crocodile Breeding and Management Training Institute, Hyderabad, I was in Manjira in Andhra Pradesh during December 1981, when in the evenings we had seen hatchling mugger feeding on insects attracted to the beam of light from our spot-lights.

As shown in Table 2, for every 100 Kg of food (here predominantly fish and prawn) the growth were 113.7 cm and 18.2 Kg during the first 3 years, and 46.1 cm and 12.4 Kg during the first 5 years. It will be extremely

interesting to watch for the results of current studies done elsewhere on the species and compare the above conversion rates obtained for a predominantly fish-prawn diet with rates for other diet. The experience in captive rearing is that through a change from a monotonous diet certain osteological problems can be rectified at an early stage, the results of current studies will also enable in selecting an economic diet with high conversion rate and no morphological or physiological complications. This is very important for a country like India which through a rigorous conservation phase is optimistically looking forward to a commercial phase. Besides, the studies will be of considerable academic significance when information for different species are available.

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## 12. STUNTED GROWTH IN CAPTIVE-REARED GHARIAL

Captive-reared crocodilians are often very stunted as a result of inadequate husbandry conditions with consequent delay in attainment of sexual maturity (Bustard 1980). This situation also obtained with many/most gharial reared in Indian zoos prior to the initiation of the Government of India/FAO/UNDP Crocodile Breeding and Management Project in 1975.

Nehru Zoological Park, Hyderabad, purchased two gharial from a dealer on 18 August 1966. Presumably they were freshly

caught. At this time they measured 1 m and 70 cm respectively and are known to have originated from Patna. These individuals were measured by us on 12 August 1979 and thereafter at six monthly intervals. The growth data are given in Table 1.

These individuals were shifted to the State Crocodile Complex, located within the Nehru

TABLE 1

GROWTH OF A PAIR OF SUB-ADULT GHARIAL AT NEHRU ZOOLOGICAL PARK, HYDERABAD (LENGTH IN M)

Date	Length	
	Male	Female
18-8-66	0.70 <sup>1</sup>	1.0
12-8-79	1.95	2.28
8-1-80	1.97	2.28
20-9-80	1.97	2.28
7-4-81	1.98	2.28

<sup>1</sup> The smaller (=younger) individual remained smaller throughout (Gowhar Ali Khan, pers. commn.)

TABLE 2

FEEDING REGIME JANUARY 1980 — JANUARY 1981 INCLUSIVE (WEIGHTS IN KG)

Month/year	Food provided	Dead fish removed	Food consumed
January 1980	10	3	7
February	10	4.3	5.7
March	17	4	13
April	12.5	2.5	10
May	10.5	1.4	9.1
June	10	—	10
July	5.9	—	5.9
August	7.7	0.2	7.5
September	13.5	1.5	12
October	11	—	11
November	10.4	1	9.4
December	12	1	11
January 1981	4	0.5	3.5